INFLUENCE ANALYSIS OF CIRCULATION SYSTEM AGAINST USER BEHAVIOR BASED ON PERCEPTION AND MOTIVATION IN SELF SUSTAINED AREA IN SURABAYA

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ABSTRACT
Self sustained area is an area designed as a sustainable solution. This area should be able to encourage the use of pedestrian paths, bike lanes, and public transportation as an effort to achieve sustainability. In reality, it can't provide empirical evidence of a reduction in the use of motor vehicles. The aim of this research is to find the influence of circulation system against user behavior based on perception and motivation that can encourage the use of pedestrian paths, bike lanes, and public transportation. The method used in this research is qualitative with descriptive statistical analysis. The results showed that the aspects influence satisfaction and motivation to use pedestrian paths and bike lane are no places to rest and no bike lanes. Users interest in using mini bus as public transportation in the region. Users of circulation system are dominated by the user with the purpose of exercise and pleasure.

Keywords: self sustained area, circulation system, perception, motivation

1. INTRODUCTION

In recent years, the concept of sustainable development is discussed as the core of spatial planning throughout the world. Currently, excessive use of motor vehicles, especially in developing countries is one of the most influential factor on the environment (Saghapour, 2013). To overcome this, city planners and transportation experts create a sustainable circulation system through the establishment of a self sustained area (Tewdwr-Jones and Williams, 2001).

Self sustained area is considered as one of the solutions of sustainability because it is supported with many kind of facilities such as education, office, recreation, and shopping in the local area. Thus it can reduce the mobility of people who also decrease the use of motor vehicles (Manaugh, 2009). According to Kamil (2008), self sustained area also need to consider the concept of circulation by providing public transportation. Self sustained area should be able to encourage the use of pedestrian path and bike lanes as an effort to achieve sustainability of the circulation system (Burton, 2003).

This study was done to find aspects that affect the user motivation towards the use of pedestrian paths, bike lanes, and public transportation. Motivation is influenced by the perception of users and the level of satisfaction of the facility usage. It is strongly influenced by the condition of the facility both safety and comfort and also the completeness of existing facilities.

2. LITERATURE REVIEW

2.1 Circulation System

The system is a combination of several components or objects that are interrelated. In any organization system, a change in one component will provide changes to other components (Tamin, 1997).

Circulation is urban design elements that can directly control the shape and pattern of activity of the city, as well as the existence of a public transportation system of roads, pedestrian, and transit areas that are interconnected to form the movement of (an activity). Circulation city covering road available, the structure of the city, and also the existing public service facilities (Shirvani, 1985).

Based on Rodrigues et al, (2011), the circulation system is everything that we use to be able to move from one place to another. Circulation system used consisted of:

"Outside buildings we use sidewalks, trails, walkways, alleys, lanes, paths, bicycle lanes, streets, roads, drives, circles, ways, boulevards, places, walks, avenues, parkways, turnpikes, expressways, thoroughfares and throughways" (page 1).

From the explanation above it can be concluded that the circulation system is a combination of system components that form part of the line that connects the city/region. The connecting lines can be:

• The road network
• Pedestrian
• Bike lanes
• Transit

2.2 Self Sustained Area

Self sustained area is an area that is able to meet the needs of shelter, work, recreation, and shopping in the area. Fulfillment of the various needs in the region will certainly reduce the mobility of people (Manaugh, 2009). Reduction of human mobility will certainly impact on the use of motor vehicles.

Self sustained area developed by the regional urban design concept that has a relatively high density housing with mixed land use. Self sustained area is based on an efficient public transport system and the layout of the city that supports the use of pedestrian and cycling paths, low energy consumption, pollution reduction, and increased social interaction within the region (Williams, 2000 in Dempsey, 2010).

2.3 Aspects That Influence The Perception And Motivation Of The Use Of Pedestrian Paths And Bike Lanes.

The success of the self sustained area to decrease the use of motor vehicles affected by the user's perception and motivation. Factors comfort and quality facilities a large impact on user behavior (Saghapour, 2013). According Manaugh and El Geneidy (2013), the level of awareness on the health of the occupants or users is one of the factors that affect the level of satisfaction and motivation of the use of pedestrian paths. Users are divided into two, namely the wish to "willing" to walk and the "happy" walk. Meanwhile, according to Bahari et al (2012), the age of users of pedestrian paths also affect the level of their satisfaction with existing facilities. Parents put the quality of the facilities provided, while users prefer the young age of the safety factor. It can be concluded that the behavior, perception, motivation, and the user's age greatly affect the level of use of pedestrian and bicycle paths. This is due to that behavioral factors, perception, motivation, and

the user's age greatly affect the level of community participation in the use of pedestrian and cycling facility.

2.4 Factors That Influence The Behavior Of System Circulation Users
The factors that influence the behavior of road users (Suraji, 2008):
  • motivation
  • environmental influences
    -land (usage and activity)
    -temperature, weather, view
    -facility, route, terminal
    -traffic flow
As for the psychological factors that influence the behavior of road users (Muhtadi, 2011):
  • motivation (business, social, recreational)
  • intelligence, adjustment
  • the process of learning, experience, habit
  • emotional factors: attention, haste
  • maturity/adulthood
  • response to other conditions: speed, turn, look right and left

3.   METHODOLOGY
3.1 Research Design
        This research used qualitative method supported by quantitative method. A questionnaire is made to collect quantitative data.
3.2 Participants
        Chosen participants are users of the circulation system in self sustained area in Surabaya. Participant for the questionnaire consisted of 37 people which 7 of them are male and 30 are female. The age range is between 20-50 years old.
3.3 Measures and Procedures
        Data from questionnaire is quantitative data then it is analyzed using descriptive statistic to see the influence of the circulation system to the user's perception and motivation in the use of pedestrian paths, bike lanes and public transportation.

4.   RESULT AND ANALYSIS (FINDING AND DISCUSSION)
        Influence Analysis of the circulation system found by distributing questionnaires to users in self sustained area in Surabaya. Observed characteristics are the influence of age and gender of the user assessment of the condition of the circulation system, the interest in the availability of public transport and motivation to use pedestrian and bicycle paths.

4.1 Influence of Age and Gender Against The Assessment Of Circulation System Condition
        From the 37 respondents surveyed, the first thing that is identified is the influence of age and gender on the assessment of the circulation system condition in self sustained area in Surabaya.

Table 1. The Assessment Of Circulation System Condition

Circulation System	Profile	Classification	Very Good	Good	Not Good	Bad	Sig. Chi-Square	Explanation
Pedestrian Way	Gender	Female	2	9	18	1	0,629	Not Related
		Male	0	2	4	1		
	Age	20-35 years old	2	9	22	0	0,000	Related
		36-50 years old	0	2	0	2		
		51-65 years old	0	0	0	0		
		>65 years old	0	0	0	0		
Bicycle Path	Gender	Female	1	11	14	4	0,925	Not Related
		Male	0	2	4	1		
	Age	20-35 years old	1	11	17	4	0,716	Not Related
		36-50 years old	0	2	1	1		
		51-65 years old	0	0	0	0		
		>65 years old	0	0	0	0		
Motorways	Gender	Female	1	4	19	6	0,227	Not Related
		Male	0	1	2	4		
	Age	20-35 years old	1	3	20	9	0,148	Not Related

Table 1. The Assessment Of Circulation System Condition

Circulation System	Profile	Classification	Very Good	Good	Not Good	Bad	Sig. Chi-Square	Explanation
Motorways		36-50 years old	0	2	1	1		
		51-65 years old	0	0	0	0		
		>65 years old	0	0	0	0		
Completeness of traffic signs	Gender	Female	0	5	13	12	0,117	Not Related
		Male	1	0	4	2		
	Age	20-35 years old	0	4	15	14	0,015	Related
		36-50 years old	1	1	2	0		
		51-65 years old	0	0	0	0		
		>65 years old	0	0	0	0		
Crossing System	Gender	Female	0	13	12	5	0,114	Not Related
		Male	1	1	4	1		
	Age	20-35 years old	0	13	14	6	0,027	Related
		36-50 years old	1	1	2	0		
		51-65 years old	0	0	0	0		
		>65 years old	0	0	0	0		

Table 1 describes the effect of the respondent profile (gender and age) on the assessment of the circulation system based on Fisher's Exact test. From the results sig. Chi square it was found that there was no link between the gender to the assessment of the circulation system. This is evident from the sig. Chi square found of alpha (0.05). As for the age profile it was found there was a correlation between the age of the assessment of pedestrian paths, completeness signs, as well as crossing systems. It looks at sig. chi small square of alpha (0.05). Age 20-35 years tend to assess the condition of the pedestrian lane, completeness signs, and crossing system is better than the age of 36-50 years.

4.2 Influence Of Age And Gender Against Satisfaction Level Of Walking Experience.

From 37 respondents surveyed, will be analyzed user satisfaction level towards the use of pedestrian paths.

Table 2. Satisfaction level of walking Experience

Profile	Classification	Satisfaction		Sig Chi-square	Explanation
		Yes	No		
Gender	Female	14	16	0,238	Not Related
	Male	5	2		
Age	20-35 years old	17	16	0,954	Not Related
	36-50 years old	2	2		
	51-65 years old	0	0		
	>65 years old	0	0		

In Table 2 it can be seen that the value of chi-square significance are all bigger than alpha (0.05), so that it can be said there is no influence of gender and age on the satisfaction of the use of pedestrian paths. Next in Table 3 will be analyzed the reasons that affect satisfaction in the experience of walking in self sustained area in Surabaya.

Table 3. Reasons Affecting Satisfaction Walking Experience

Reason	Description	Frequency	Percent
Reasons not like	Broken facility	3	15
	Remotely	4	20
	Temperature heat	3	15
	Quiet environment	1	5
	There is no resting place	1	5
	The width of the narrow road	1	5
Reasons like	Comfortable	4	20
	Shade	2	10
	Sports	1	5

From 51% of users who do not like the experience of walking in self sustained area in Surabaya discovered that the reason causes they do not enjoy the experience of walking are a long distance (20%), poor facilities (15%), and also due to the hot temperatures (15%). While 49% of users who liked the experience of walking found the reason causes them enjoy the experience of walking are comfortable (20%) and the shady circumstances (10%).

Next in Table 4 will be analyzed user assessment of the aspects of pedestrian path that can also affect the level of satisfaction and motivation of the use of pedestrian paths.

Table 4. Assessment Aspects Affecting Satisfaction and Motivation Use of Pedestrian

Elements of pedestrian	Answer	
	Yes	No
The presence of inhibitory pathways	43%	57%
Leisure bandwidth	76%	24%
Availability of shade trees along the path	76%	24%
Completeness of crossing signs	30%	70%
Leisure environment	81%	19%
Security	76%	24%
Lighting at night	73%	27%
Visual beauty of the buildings along the path	73%	27%
Availability place to rest	16%	84%
There are other walkers	51%	49%
Tolerance motorists	62%	38%

Four of the biggest aspects that influence satisfaction and motivation to use the pedestrian path are the availability of a place to rest (84% say they are not yet available), completeness crossing signs (70% declared incomplete), the presence of inhibitors such as bush pedestrian path, the uneven surface (43% stated no inhibitor), and the absence of other hikers belt of pedestrians (49% expressed no other hikers).

4.3 Influence Of Age And Gender Against Satisfaction Level Of Cycling

Next in Table 5 will analyze the level of satisfaction of the user experience of cycling in self sustained area in Surabaya.

Table 5. Satisfaction Of Cycling Experience

Profile	Classification	Satisfaction		Sig Chi-square	Explanation
		Yes	No		
Gender	Female	12	18	0,133	Not related
	Male	5	2		
Age	20-35 years old	15	18	0,863	Not related
	36-50 years old	2	2		
	51-65 years old	0	0		
	>65 years old	0	0		

The value of chi-square significance showing all bigger than alpha (0.05), so that it can be said there is no influence of gender and age on the satisfaction of the use of bicycles. Next in Table 6 will be analyzed the reasons that affect satisfaction cycling experience in self sustained area in Surabaya.

Table 6. Reasons Affecting Satisfaction Cycling Experience

Reason Percent	Description	Frequency	Percent
Reasons not like	There is no bike lane	5	22
	Unable to cycling	1	4
	Quiet environment	2	9
	Not like cycling	1	4
	Do not have a bike	3	13
	Uncomfortable	2	9
Reasons like	Like cycling	5	22
	Comfortable	1	4
	Sports	3	13

From 54% of users who do not like the experience of cycling found that most reason they do not enjoy the experience of cycling are no bike lane (22%), do not have a bike (13%), the environment is too quiet (9%), and due to the uncomfortable (9%). While 46% of users who liked the experience of cycling has most reason they loved the experience of cycling are because like cycling (22%) and sports (13%).

Next in Table 7 will be analyzed user assessment of the aspects of the bike path that can also affect the level of satisfaction and motivation to use the bike lane.

Table 7. Assessment Aspects Affecting Satisfaction and Motivation Use Bike Lane

Elements of the bike path	Answer	
	Yes	No
Comfort (wide bike path)	81%	19%
Leisure environment	78%	22%
Security	73%	27%
Availability of parking	30%	70%
Security bicycle parking	35%	65%
Completeness of traffic signs	27%	73%
Tolerance motorists	46%	54%

The four largest element which has a poor condition or not available are the traffic signs are not complete (73% declared incomplete), bicycle parking space is not available (70% stated not yet available), bicycle parking provided unsafe (65 % declared unsafe), and motorists who are not tolerant to the bike path users (54% declared intolerant).

4.4 Influence Of Age And Gender On The Interest Of Public Transport Provision
From 37 respondents will be analyzed the level of interest in the provision of public transport in self sustained area in Surabaya described in Table 8.

Table 8. Influence Of Age And Gender On The Interest Of Public Transport Provision

Profile	Classification	Satisfaction		Sig Chi-square	Keterangan
		Yes	Yes		
Gender	Female	21	9	0,042	Related
	Male	2	5		
Age	20-35 years old	21	12	0,595	Not related
	36-50 years old	2	2		
	51-65 years old	0	0		
	>65 years old	0	0		

With Fisher Exact Test, obtained as above table. Of the value of sig (0,042) less than alpha (0.05), meaning there is a correlation between gender and the desire to use public transport. Then, to clarify whether the gender men and women have different treatment (in this case that the use of public transport) using cross tabulation table, with assessment:

0 = no, 1 = yes; f = female, m = male

found that the number of women with a yes, compared with men with no answer is 21: 2, so that it can be said that women prefer to use public transport than men. As for the age profile was not found association with an interest in the use of public transport. It looks at sig. Chi square is bigger than alpha (0.05). Next in Table 9 will be analyzed public transport type desired by users.

Table 9. Public Transport Type Desired By Users

Type of public transportation	Frequency	Percent
Public transportation	2	9
Mini bus	12	52
Tram	3	13
Carriage	1	4
Pedicab	5	22

From 62% of users who expressed interest to use public transport, the type of public transportation most desired by the user is a type of mini buses (52%).

4.5 Motivation That Encourages The Use Of Pedestrian And Bicycle Paths

In Table 10 and Table 11 will be described user motivation towards the use of pedestrian and bicycle paths in self sustained area in Surabaya.

Table 10. Motivation The Use Of Pedestrian Way

Motivation The Use Of Pedestrian Way	Gender		Age			
	Female	Male	20-35 years old	36-50 years old	51-65 years old	>65 years old
Not having a motor vehicle	2%	5%	2%	7%	0	0
Sports	21%	37%	23%	31%	0	0
Pleasure	14%	5%	13%	8%	0	0
At close range	23%	16%	22%	23%	0	0
Aesthetic environment	13%	21%	15%	8%	0	0
Comfortable	14%	16%	15%	8%	0	0
Walking is good for the environment	13%	0%	10%	15%	0	0

From 81% of female respondents found that the four main motivation are short distance (23%), sports (21%), comfortable (14%), and pleasure (14%). While 19% of male respondents found that the four main motivation to walk are exercise (37%), the aesthetics of the environment (21%), a short distance (16%), and comfort (16%). From these results it can be said that the main motivation of women walk is due to the close distance while the main motivation of men are exercising.

While when viewed from the profile of respondents by age, from 89% of respondents aged 20-35 years found that four main motivation to walk are a sport (23%), a short distance (22%), the aesthetic environment (15%), and comfort (16%). While 11% of respondents aged 36-50 years found that three main motivation walking are sports (31%), a short distance (23%), and walking is good for the environment (15%). From these results it can be said that the main motivation aged 20-35 years and 36-50 years are the same, namely to exercise. Next in Table 11 will be analyzed user motivation towards the use of bicycle paths.

Table 11. Motivation The Use Of Bicycle Paths

Motivation the use of bicycle paths	Gender		Age			
	Female	Male	20-35 years old	36-50 years old	51-65 years old	>65 years old
Not having a motor vehicle	2%	5%	2%	8%	0	0
Sports	22%	29%	23%	31%	0	0
Pleasure	21%	14%	19%	15%	0	0
At close range	15%	14%	15%	15%	0	0
Aesthetic environment	12%	24%	15%	8%	0	0
Comfortable	13%	9%	13%	8%	0	0
Cycling is good for the environment	15%	5%	13%	15%	0	0

From 81% of female respondents found that the four main motivation to cycling are sports (22%), pleasure (21%), short distance (15%), and cycling is good for the environment (15%). While 19% of male respondents found that the four main motivation to cycling are sports (29%), the aesthetics of the environment (24%), short distance (14%), and pleasure (14%). From these results it can be said that the main motivation of women and men cycling is exercise.

While when viewed from the profile of respondents by age, from 89% of respondents aged 20-35 years found that four main motivation to cycling are sports (23%), pleasure (19%), the aesthetic environment (15%), and short distance (15 %). While 11% of respondents aged 36-50

years found that three main motivation to cycling are sports (31%), short distance (15%), and cycling is good for the environment (15%). From these results it can be said that the main motivation cycling aged 20-35 and 36-50 years are the same, namely to exercise.

5.   CONCLUSION

From the survey results it can be concluded that no correlation was found between the gender on the assessment of the circulatory system in self sustained area in Surabaya. As for age correlations were found for assessment of pedestrian paths, completeness signs, as well as crossing systems. Age 20-35 years tend to assess the condition of the pedestrian lane, completeness signs, and also crossing system better than 36-50 years of age.

The main reason users do not like walking experience is due to the long distance. The aspects that influence satisfaction and motivation to use pedestrian paths are no places to rest and crossing signs incomplete. As for the bike path, the main reason users do not like the experience of cycling is because there are no special lanes for cyclists. The aspects that influence satisfaction and motivation to use the bike lanes are traffic signs are incomplete and lack of bicycle parking places.

Users of circulation system in self sustained area in Surabaya has a great interest in the use of public transportation in the region. The type of public transport demand by users is a mini bus. Meanwhile users of bike lanes and pedestrian paths is dominated by the movement of the user with the purpose of recreation. These users are users whose primary motivation is to perform the movement of exercise and pleasure.

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